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Park et al.

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(54) **METHOD OF MANAGING USER LOG-IN TO CLOUD-BASED APPLICATION AND IMAGE FORMING APPARATUS PERFORMING THE METHOD**

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G06F 3/12 (2006.01)
H04N 1/44 (2006.01)

(52) **U.S. Cl.**
CPC ***H04L 63/083*** (2013.01); ***G06F 3/1204*** (2013.01); ***G06F 3/1271*** (2013.01); ***G06F 3/1285*** (2013.01); ***H04N 1/4426*** (2013.01); *G06F 3/1222* (2013.01); *G06F 3/1238* (2013.01)

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CPC H04L 63/08; H04L 63/083; H04L 63/10; H04W 12/06; G06F 21/31
USPC 726/7
See application file for complete search history.

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(57) **ABSTRACT**

An image forming apparatus includes a communication interface unit to perform communication with a cloud server that provides an application service; a user interface unit to display a screen and receive a user input; a storage unit to store a database that corresponds to an application that is installed in the image forming apparatus; an image forming operation performing unit to perform an image forming operation; and a control unit that stores user log-in information in the database that corresponds to the application, so as to match the user log-in information with a user account for the image forming apparatus, and manages a log-in to a user account for the application by using the stored user log-in information.

20 Claims, 9 Drawing Sheets

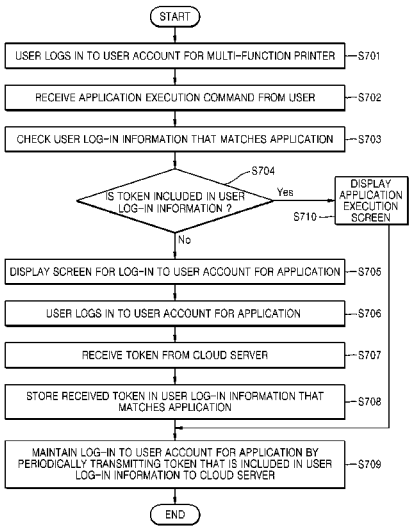


FIG. 1

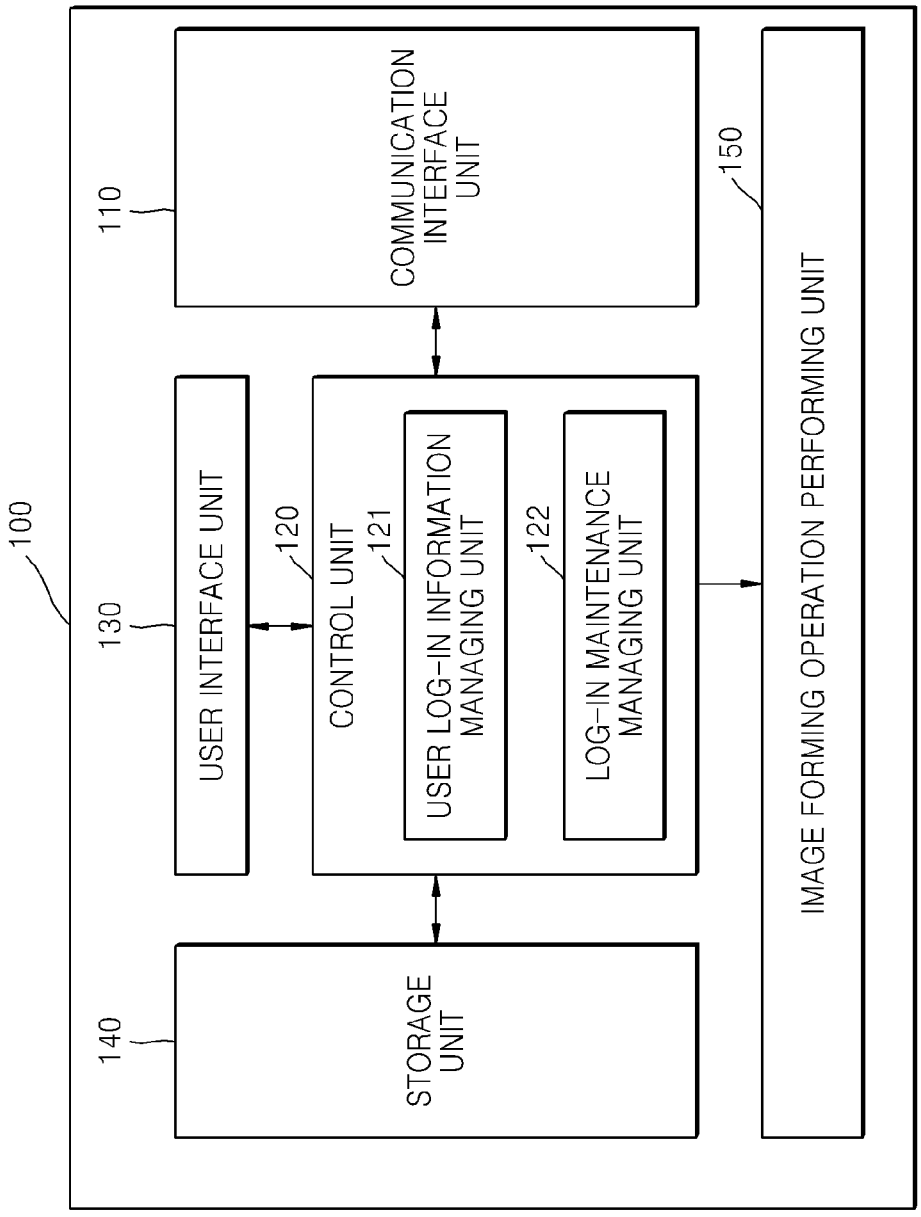

100
110
COMMUNICATION INTERFACE UNIT
150
IMAGE FORMING OPERATION PERFORMING UNIT
130
USER INTERFACE UNIT
120
CONTROL UNIT
121
USER LOG-IN INFORMATION MANAGING UNIT
122
LOG-IN MAINTENANCE MANAGING UNIT
140
STORAGE UNIT

FIG. 2

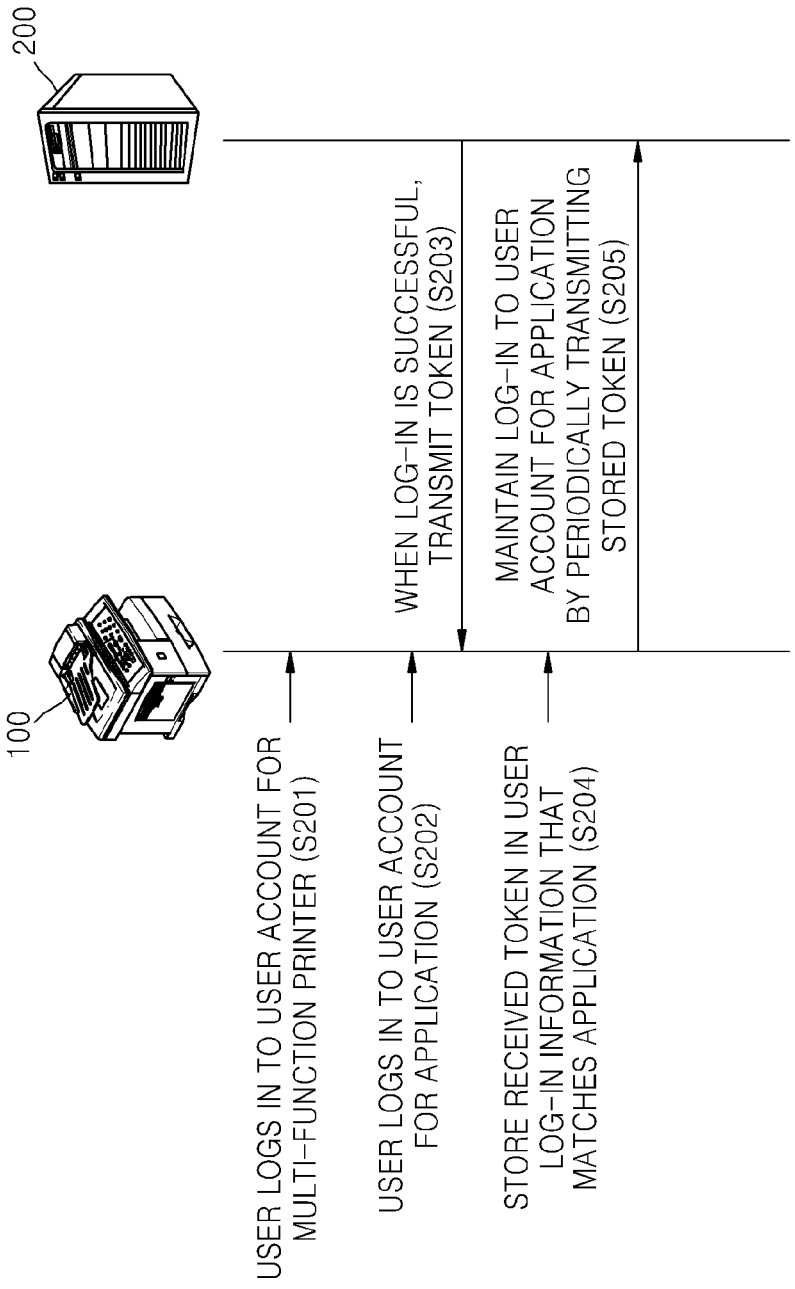

200
100
USER LOGS IN TO USER ACCOUNT FOR MULTI-FUNCTION PRINTER (S201)
USER LOGS IN TO USER ACCOUNT FOR APPLICATION (S202)
WHEN LOG-IN IS SUCCESSFUL, TRANSMIT TOKEN (S203)
STORE RECEIVED TOKEN IN USER LOG-IN INFORMATION THAT MATCHES APPLICATION (S204)
MAINTAIN LOG-IN TO USER ACCOUNT FOR APPLICATION BY PERIODICALLY TRANSMITTING STORED TOKEN (S205)

FIG. 3

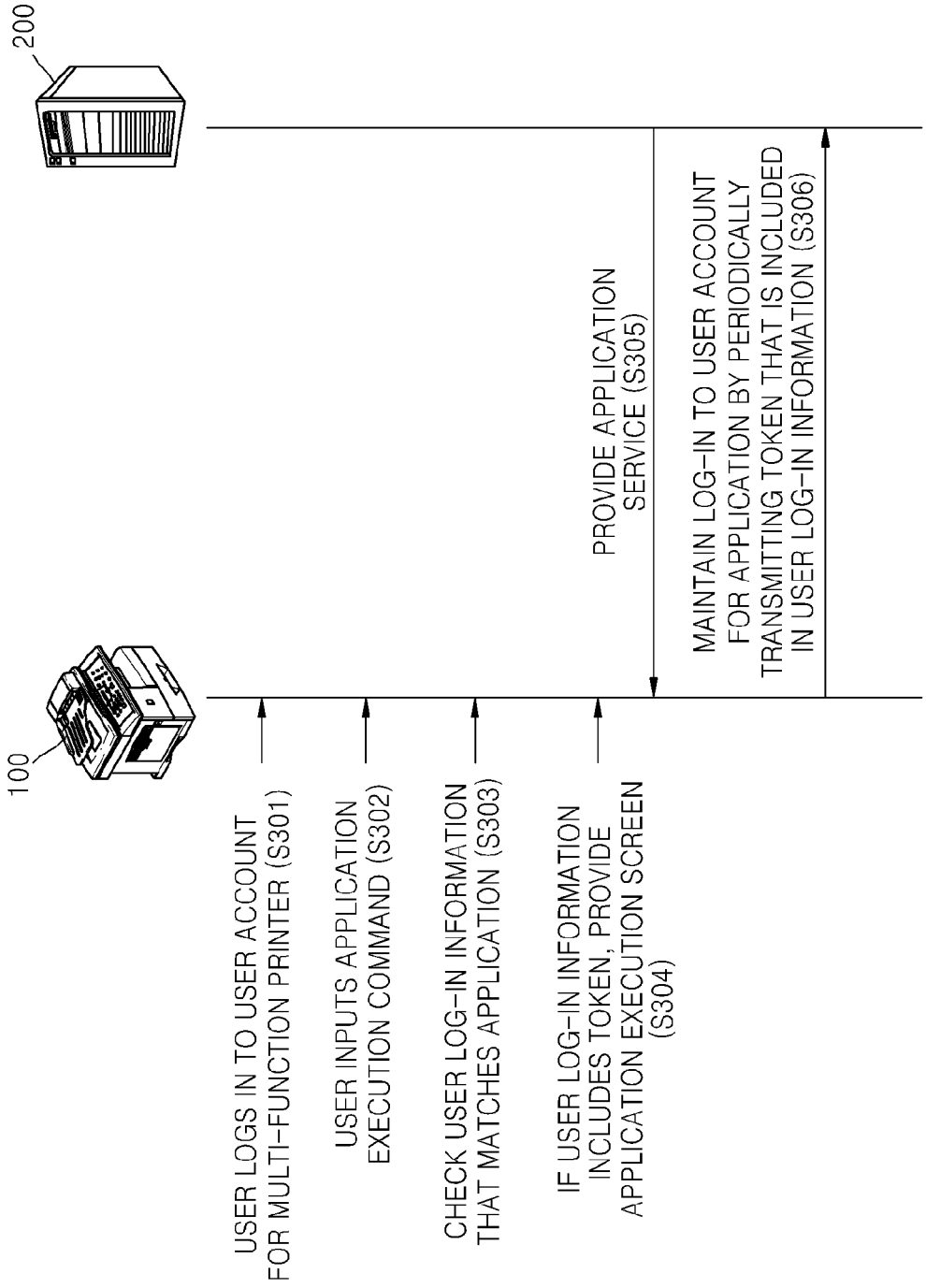

200
100
USER LOGS IN TO USER ACCOUNT FOR MULTI-FUNCTION PRINTER (S301)
USER INPUTS APPLICATION EXECUTION COMMAND (S302)
CHECK USER LOG-IN INFORMATION THAT MATCHES APPLICATION (S303)
IF USER LOG-IN INFORMATION INCLUDES TOKEN, PROVIDE APPLICATION EXECUTION SCREEN (S304)
PROVIDE APPLICATION SERVICE (S305)
MAINTAIN LOG-IN TO USER ACCOUNT FOR APPLICATION BY PERIODICALLY TRANSMITTING TOKEN THAT IS INCLUDED IN USER LOG-IN INFORMATION (S306)

FIG. 4

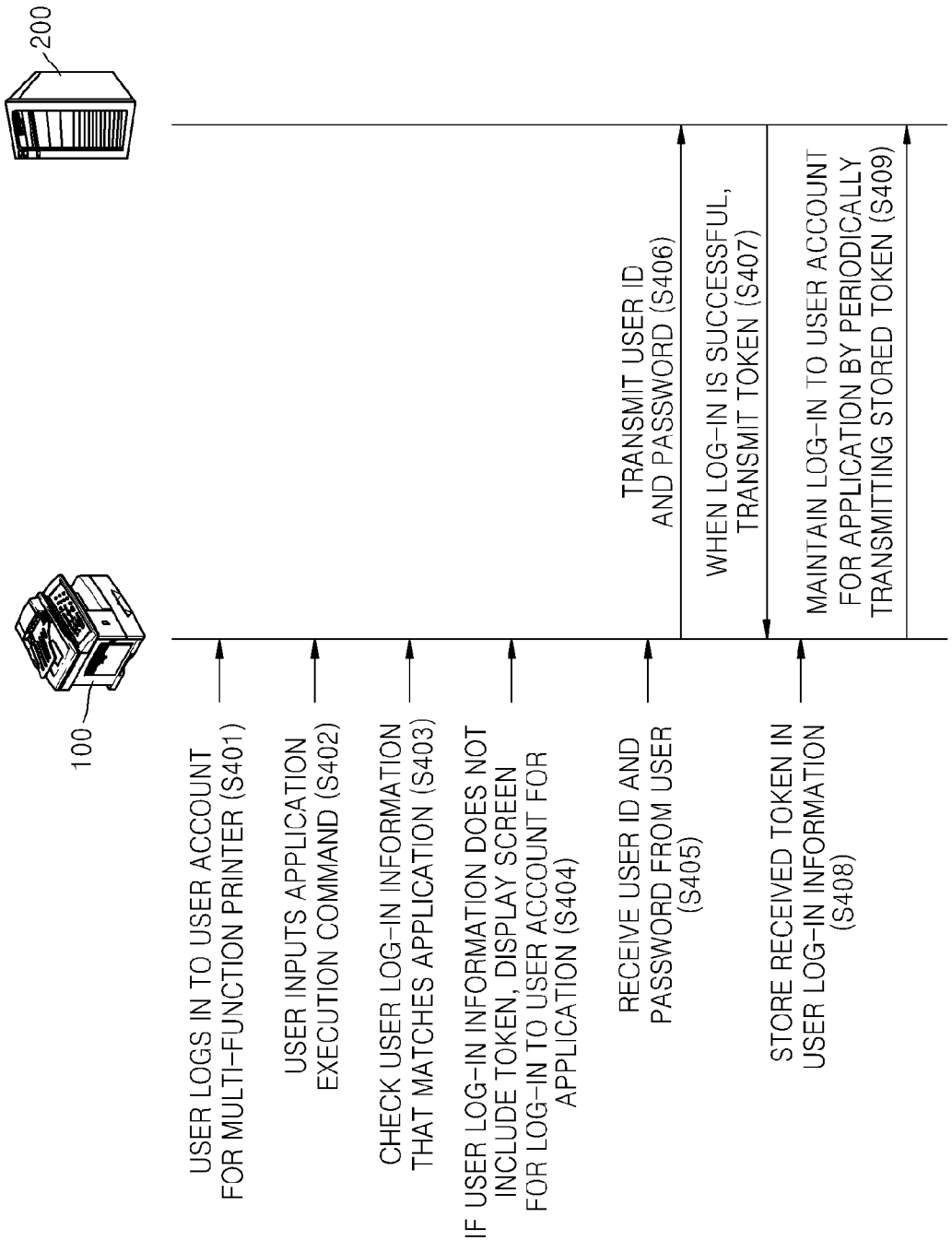

200
100
USER LOGS IN TO USER ACCOUNT FOR MULTI-FUNCTION PRINTER (S401)
USER INPUTS APPLICATION EXECUTION COMMAND (S402)
CHECK USER LOG-IN INFORMATION THAT MATCHES APPLICATION (S403)
IF USER LOG-IN INFORMATION DOES NOT INCLUDE TOKEN, DISPLAY SCREEN FOR LOG-IN TO USER ACCOUNT FOR APPLICATION (S404)
RECEIVE USER ID AND PASSWORD FROM USER (S405)
TRANSMIT USER ID AND PASSWORD (S406)
WHEN LOG-IN IS SUCCESSFUL, TRANSMIT TOKEN (S407)
STORE RECEIVED TOKEN IN USER LOG-IN INFORMATION (S408)
MAINTAIN LOG-IN TO USER ACCOUNT FOR APPLICATION BY PERIODICALLY TRANSMITTING STORED TOKEN (S409)

FIG. 5

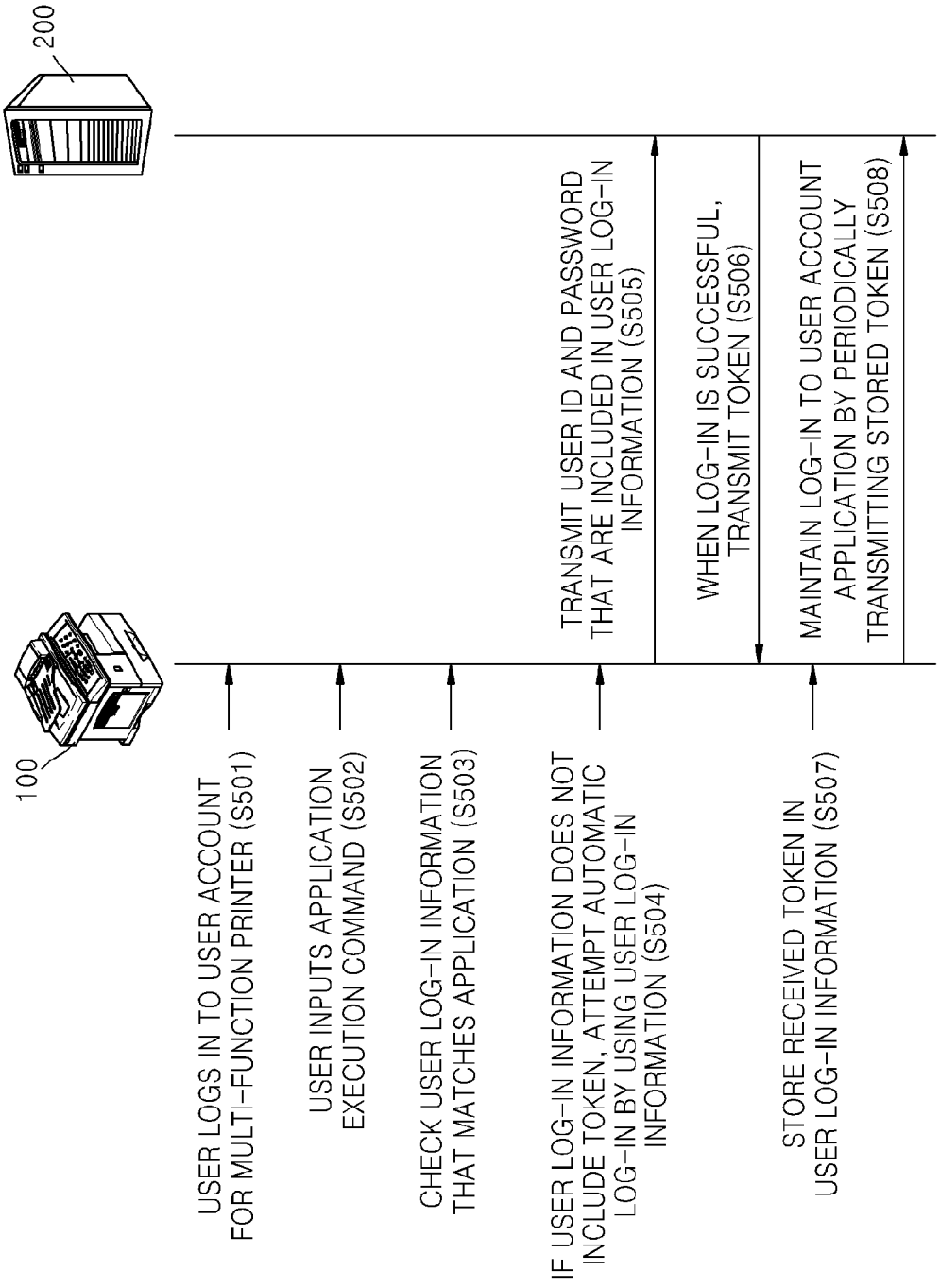

200
100
USER LOGS IN TO USER ACCOUNT FOR MULTI-FUNCTION PRINTER (S501)
USER INPUTS APPLICATION EXECUTION COMMAND (S502)
CHECK USER LOG-IN INFORMATION THAT MATCHES APPLICATION (S503)
IF USER LOG-IN INFORMATION DOES NOT INCLUDE TOKEN, ATTEMPT AUTOMATIC LOG-IN BY USING USER LOG-IN INFORMATION (S504)
TRANSMIT USER ID AND PASSWORD THAT ARE INCLUDED IN USER LOG-IN INFORMATION (S505)
WHEN LOG-IN IS SUCCESSFUL, TRANSMIT TOKEN (S506)
STORE RECEIVED TOKEN IN USER LOG-IN INFORMATION (S507)
MAINTAIN LOG-IN TO USER ACCOUNT APPLICATION BY PERIODICALLY TRANSMITTING STORED TOKEN (S508)

FIG. 6

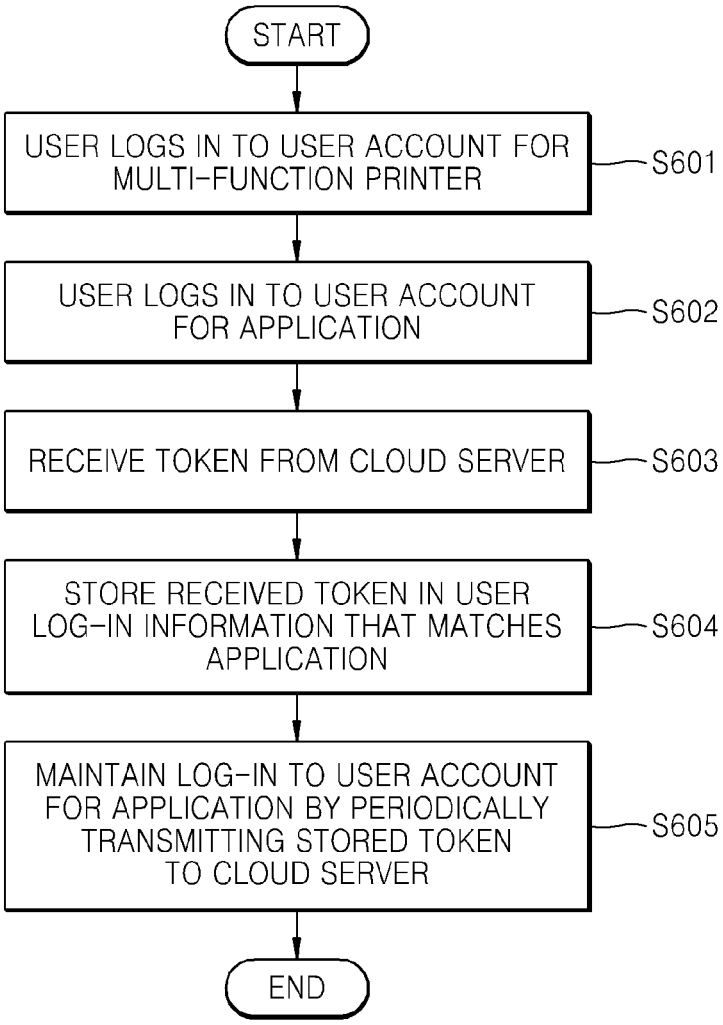

START
USER LOGS IN TO USER ACCOUNT FOR MULTI-FUNCTION PRINTER
S601
USER LOGS IN TO USER ACCOUNT FOR APPLICATION
S602
RECEIVE TOKEN FROM CLOUD SERVER
S603
STORE RECEIVED TOKEN IN USER LOG-IN INFORMATION THAT MATCHES APPLICATION
S604
MAINTAIN LOG-IN TO USER ACCOUNT FOR APPLICATION BY PERIODICALLY TRANSMITTING STORED TOKEN TO CLOUD SERVER
S605
END

FIG. 7

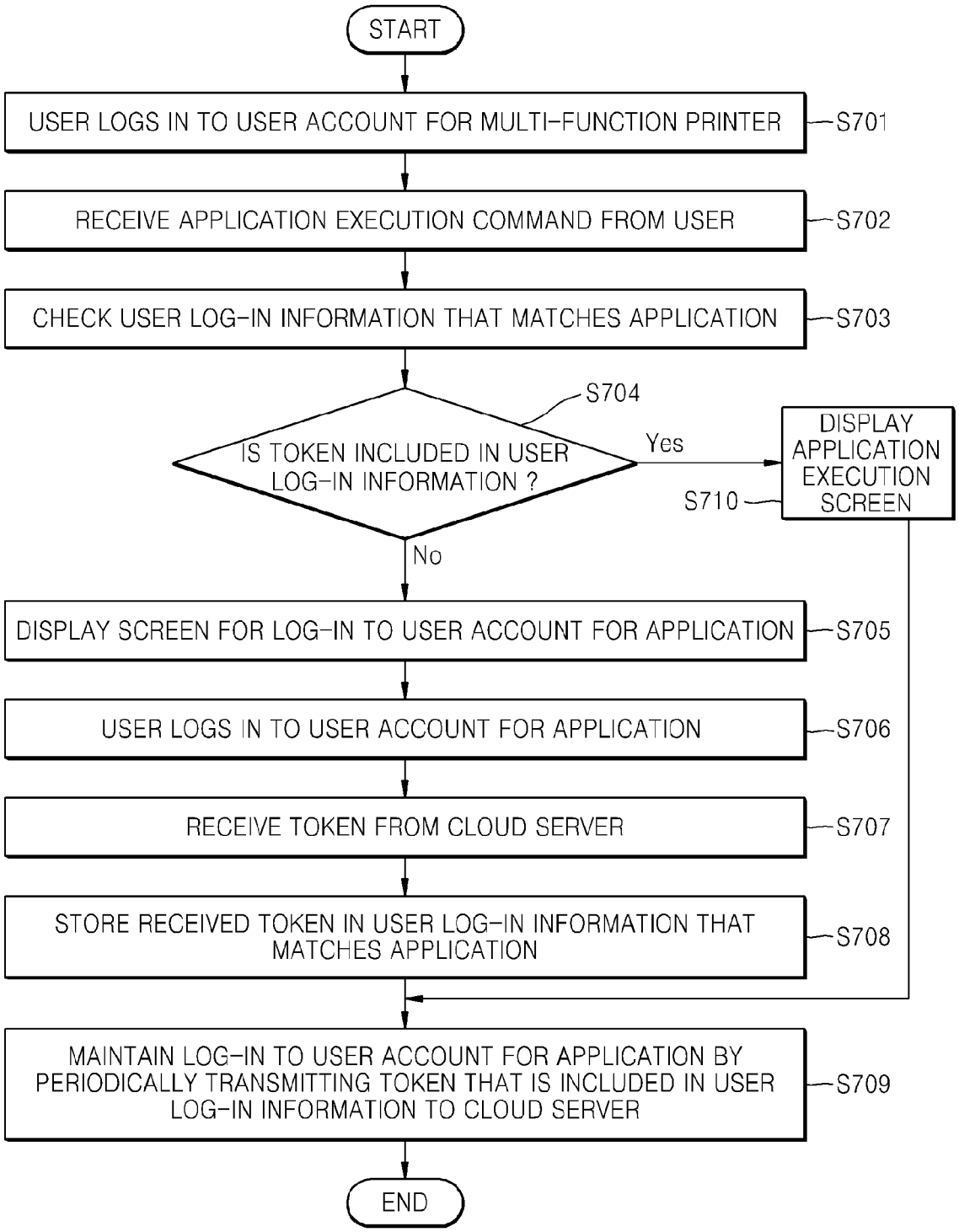

START
USER LOGS IN TO USER ACCOUNT FOR MULTI-FUNCTION PRINTER
S701
RECEIVE APPLICATION EXECUTION COMMAND FROM USER
S702
CHECK USER LOG-IN INFORMATION THAT MATCHES APPLICATION
S703
S704
IS TOKEN INCLUDED IN USER LOG-IN INFORMATION ?
Yes
DISPLAY APPLICATION EXECUTION SCREEN
S710
No
DISPLAY SCREEN FOR LOG-IN TO USER ACCOUNT FOR APPLICATION
S705
USER LOGS IN TO USER ACCOUNT FOR APPLICATION
S706
RECEIVE TOKEN FROM CLOUD SERVER
S707
STORE RECEIVED TOKEN IN USER LOG-IN INFORMATION THAT MATCHES APPLICATION
S708
MAINTAIN LOG-IN TO USER ACCOUNT FOR APPLICATION BY PERIODICALLY TRANSMITTING TOKEN THAT IS INCLUDED IN USER LOG-IN INFORMATION TO CLOUD SERVER
S709
END

FIG. 8

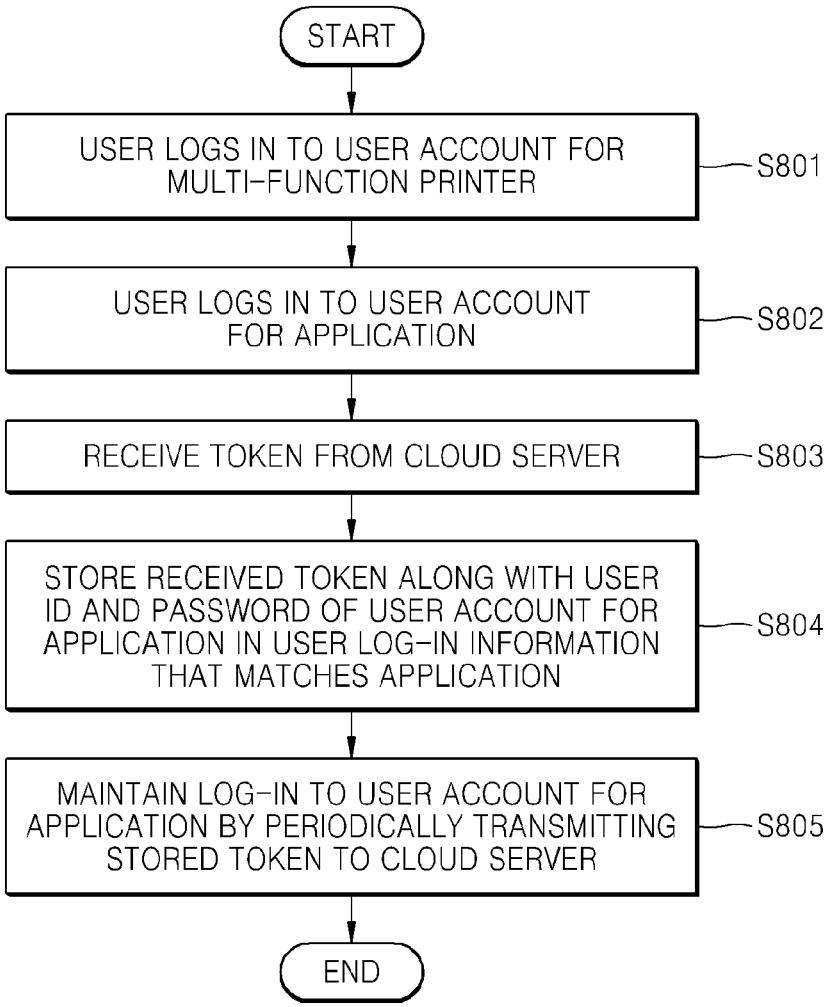
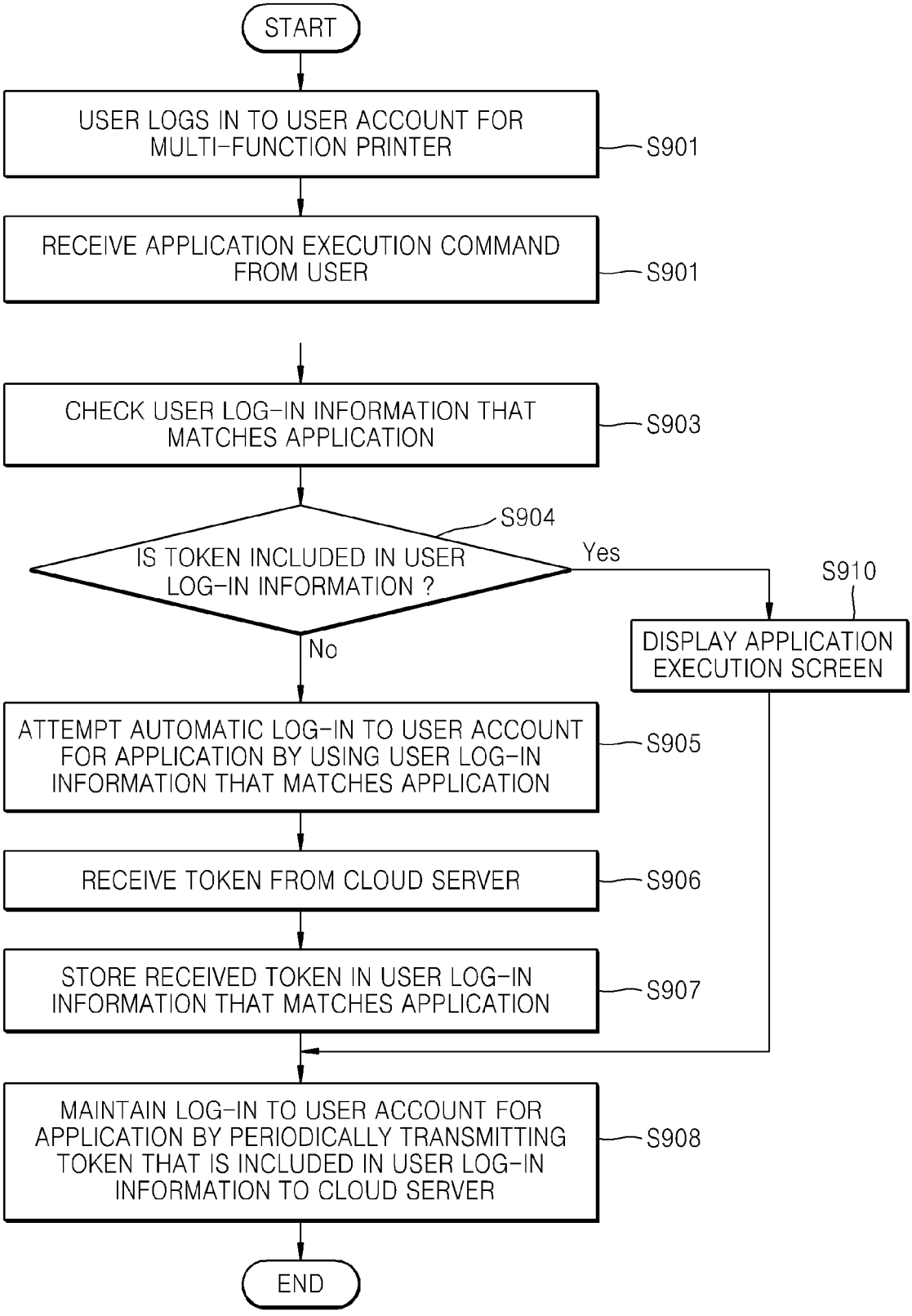

START
USER LOGS IN TO USER ACCOUNT FOR MULTI-FUNCTION PRINTER
S801
USER LOGS IN TO USER ACCOUNT FOR APPLICATION
S802
RECEIVE TOKEN FROM CLOUD SERVER
S803
STORE RECEIVED TOKEN ALONG WITH USER ID AND PASSWORD OF USER ACCOUNT FOR APPLICATION IN USER LOG-IN INFORMATION THAT MATCHES APPLICATION
S804
MAINTAIN LOG-IN TO USER ACCOUNT FOR APPLICATION BY PERIODICALLY TRANSMITTING STORED TOKEN TO CLOUD SERVER
S805
END

FIG. 9


START
USER LOGS IN TO USER ACCOUNT FOR MULTI-FUNCTION PRINTER
S901
RECEIVE APPLICATION EXECUTION COMMAND FROM USER
S901
CHECK USER LOG-IN INFORMATION THAT MATCHES APPLICATION
S903
S904
IS TOKEN INCLUDED IN USER LOG-IN INFORMATION ?
Yes
S910
DISPLAY APPLICATION EXECUTION SCREEN
No
ATTEMPT AUTOMATIC LOG-IN TO USER ACCOUNT FOR APPLICATION BY USING USER LOG-IN INFORMATION THAT MATCHES APPLICATION
S905
RECEIVE TOKEN FROM CLOUD SERVER
S906
STORE RECEIVED TOKEN IN USER LOG-IN INFORMATION THAT MATCHES APPLICATION
S907
MAINTAIN LOG-IN TO USER ACCOUNT FOR APPLICATION BY PERIODICALLY TRANSMITTING TOKEN THAT IS INCLUDED IN USER LOG-IN INFORMATION TO CLOUD SERVER
S908
END

METHOD OF MANAGING USER LOG-IN TO CLOUD-BASED APPLICATION AND IMAGE FORMING APPARATUS PERFORMING THE METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of Korean Patent Application No. 10-2013-0025248, filed on Mar. 8, 2013, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present inventive concept relates to a method of managing, by an image forming apparatus, a log-in to a cloud-based application, and an image forming apparatus to perform the method.

2. Description of the Related Art

A cloud service indicates a service by which a user may store content, such as documents, music files, images, or the like, in a cloud server and then may download content to a device, such as a smartphone, or may upload at least one piece of content to the cloud server.

Recently, the cloud service has become widely used and thus may be used in various types of devices, and in particular, a multi-functional device enabled for network communication may use the cloud server through a cloud-based application installed therein. For example, an application, such as a Google Docs application, may be installed and executed in the multi-functional device, and then the multi-functional device may upload a document file, which is scanned by the multi-functional device, to the cloud server or may download a document that is stored in the cloud server and then may output the document.

In order to use the cloud-based application in the multi-functional device, the user has to log in to the multi-functional device via a multi-functional device account and then log in again via an account of an application. However, it is inconvenient for the user to be required to input text to repeat a log-in process whenever the user uses an application in the multi-functional device. Also, after the user logs into the multi-functional device, the user may want to easily use applications without separate log-in processes, and thus, there is an increasing demand for a technology capable of satisfying user needs.

SUMMARY OF THE INVENTION

The present inventive concept provides a method of managing, by an image forming apparatus, a log-in to a cloud-based application. The present invention also provides an image forming apparatus to perform the above described method.

Additional features and utilities of the present general inventive concept will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the general inventive concept.

Exemplary embodiments of the general inventive concept provide an image forming apparatus including a communication interface unit to perform communication with a cloud server that provides an application service; a user interface unit to display a screen and receive a user input; a storage unit to store a database that corresponds to an application that is installed in the image forming apparatus; an image forming operation performing unit to perform an image forming operation; and a control unit, wherein the control unit stores user log-in information in the database that corresponds to the application, so as to match the user log-in information with a user account for the image forming apparatus, and manages a log-in to a user account for the application by using the stored user log-in information.

The control unit may include a user log-in information managing unit to receive a token from the cloud server and store the token in the user log-in information that matches with the user account for the image forming apparatus, when the user, who logs in to the user account for the image forming apparatus, logs in to the user account for the application; and a log-in maintenance managing unit to maintain the log-in to the user account for the application by periodically transmitting the token that is stored in the user log-in information to the cloud server.

Exemplary embodiments of the general inventive concept also provide a method of managing a log-in to a cloud-based application, the method including operations of receiving an application execution command related to the cloud-based application from a user who logs in to a user account for an image forming apparatus; storing user log-in information in a database that corresponds to the cloud-based application, so as to match the user log-in information with the user account for the image forming apparatus; and managing the log-in to a user account for the cloud-based application by using the stored user log-in information.

The operation of storing of the user log-in information may include operations of receiving a token from a cloud server that provides a service of the cloud-based application, when the user logs in to the user account for the cloud-based application; and storing the token in the user log-in information.

The operation of managing the log-in may include an operation of maintaining the log-in to the user account for the cloud-based application by periodically transmitting the token that is stored in the user log-in information to the cloud server.

Exemplary embodiments of the general inventive concept also provide a method of managing a log-in to a cloud-based application, the method including operations of receiving an application execution command related to the cloud-based application from a user who logs in to a user account for an image forming apparatus; checking user log-in information that matches the user account for the image forming apparatus and that is stored in a database that corresponds to the cloud-based application; and managing the log-in to a user account for the cloud-based application by using the stored user log-in information.

Exemplary embodiments of the general inventive concept also provide an image forming apparatus that communicates with a cloud server which provides application services, the image forming apparatus comprising: a user interface unit to display a screen and receive a user input; a storage unit to store databases that correspond to respective applications that are installed in the image forming apparatus; and a control unit to store user log-in information in the databases corresponding to the respective applications, so as to match the user log-in information with a user account for the image forming apparatus, and to manage a log-in to a user account for each application by using the stored user log-in information.

In an exemplary embodiment, the control unit comprises: a user log-in information managing unit to receive a token from the cloud server and store the token in the user log-in information that matches with the user account for the image

forming apparatus, when the user, who logs into the user account for the image forming apparatus, logs into a user account for one of the applications; and a log-in maintenance managing unit to maintain the log-in status to the user account for the application by periodically transmitting the token that is stored in the user log-in information to the cloud server.

In an exemplary embodiment, when the control unit receives an application execution command from the user who logs into the user account for the image forming apparatus, the control unit checks the user log-in information that matches the user account for the image forming apparatus from the database that corresponds to the application, and when the user log-in information includes a token, the control unit displays an application execution screen on the user interface unit.

BRIEF DESCRIPTION OF THE DRAWINGS

These and/or other features and utilities of the present general inventive concept will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. **1** illustrates a structure of an image forming apparatus according to an embodiment of the present inventive concept;

FIGS. **2** through **5** illustrate operations that are performed in the image forming apparatus and a cloud server when a method of managing a log-in to a cloud-based application is performed, according to embodiments of the present inventive concept; and

FIGS. **6** through **9** are flowcharts of a method of managing a log-in to a cloud-based application, according to embodiments of the present inventive concept.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the embodiments of the present general inventive concept, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present general inventive concept while referring to the figures.

FIG. **1** illustrates a structure of an image forming apparatus **100** according to an embodiment of the present inventive concept. Referring to FIG. **1**, the image forming apparatus **100** may include a communication interface unit **110**, a control unit **120**, a user interface unit **130**, a storage unit **140**, and an image forming operation performing unit **150**. Also, the control unit **120** may include a user log-in information managing unit **121** and a log-in maintenance managing unit **122**.

Before each element of the image forming apparatus **100** is described, first, a cloud-based application is briefly described.

The cloud-based application indicates an application providing a cloud service. Examples of the cloud-based application include a Google Docs application, a Google Calendar application, an Office 365 application, or the like. For example, a user may store a file, such as a document, in a cloud server via a device, such as a computer or a smartphone, in which the Google Docs application is installed, and may download the file at the device from the cloud server when the user needs it.

Also, the cloud service may be used in an image forming apparatus, such as a multi-function printer (MFP). For example, the user may install and execute the Google Docs application in the MFP and then may upload a document, which is scanned by the MFP, to the cloud server or may download a document that is stored in the cloud server and output the downloaded document via the MFP in any of the forms in which an MFP outputs a document, including printing the document, faxing the document, etc.

Referring back to FIG. **1**, elements of the image forming apparatus **100** will now be described in detail.

The communication interface unit **110** performs communication with a cloud server that provides a cloud-based application service. That is, the communication interface unit **110** exchanges data with the cloud server via a wired or a wireless communication, so that the communication interface unit **110** transmits data, which is uploaded by a user, to the cloud server, or receives user-target data from the cloud server and then provides it to the user.

The user interface unit **130** may display a screen to the user and may receive an application execution command or the like from the user. For example, the user interface unit **130** may display a list of applications installed in the image forming apparatus **100** on a display panel, such as a touch screen that is enabled to receive a touch input, and then the user may select an application to be executed by touching the application on the touch screen. Also, in a case of a user log-in, a user identification (ID) and a password may be input via the user interface unit **130**, and since it is difficult for the image forming apparatus **100** to have a separate input device, such as a computer keyboard, due to spatial limitations, the input may be performed via the touch screen. In general, the input of text, such as the user ID and the password, via a user interface unit may be rather inconvenient.

The image forming operation performing unit **150** may perform an image forming operation according to a control by the control unit **120**, and in particular, the image forming operation performing unit **150** may perform an application-based operation by downloading the document file stored in the cloud server and then printing the document file or outputting the document file in another form in which an MFP outputs a document file.

The control unit **120** controls an operation that is performed by using the cloud-based application, and manages a log-in to a user account for an application. Operations of the control unit **120** are described in detail with reference to examples below.

The storage unit **140** may store a plurality of databases that correspond to applications, respectively, which are installed in the image forming apparatus **100**. The image forming apparatus **100** may arrange respective databases for respective applications, and store a plurality of pieces of user log-in information that match the applications, respectively, in the databases that correspond to the applications, respectively. Also, the control unit **120** manages the log-in to the user account for the application by using one of the plurality of pieces of stored user log-in information. That is, the databases that correspond to the applications, respectively, store the plurality of pieces of user log-in information that match user accounts for the image forming apparatus **100**, respectively.

Here, the user log-in information may be required to manage the log-in to the user account for the application and may include a token that is received from the cloud server when the log-in to the user account for the application is successful. Here, the user log-in information may include only the token, or may include the token and also a user ID and a password for the user account for the application. The token that is stored in the user log-in information may be stored after being encrypted for security.

For example, in a case where the Google Docs and Google Calendar applications are installed in the image forming apparatus **100**, a database that corresponds to the Google Docs application and a database that corresponds to the Google Calendar application are separately arranged and stored in the storage unit **140**.

If a first user, whose user ID for a user account for the image forming apparatus **100** is "user**1**," logs into the image forming apparatus **100**, executes the Google Docs application, and then logs into a user account for the Google Docs application, the image forming apparatus **100** receives a token via the communication interface unit **110** from a cloud server that provides a Google Docs service. Afterward, a space that corresponds to "user**1**" is generated in the database that corresponds to the Google Docs application, and then the token from the cloud server is stored in the generated space. Here, the token that is stored to match "user**1**" corresponds to the user log-in information.

Also, if a second user, whose user ID for a user account for the image forming apparatus **100** is "user**2**," logs into the image forming apparatus **100**, executes the Google Calendar application, and then logs into a user account for the Google Calendar application, the image forming apparatus **100** receives a token via the communication interface unit **110** from a cloud server that provides a Google Calendar service. Afterward, a space that corresponds to "user**2**" is generated in the database that corresponds to the Google Calendar application, and then the token from the cloud server is stored in the generated space. Here, the token that is stored to match "user**2**" corresponds to the user log-in information.

As described above, a user ID and a password for a user account for an application of the user may be encrypted and stored in the user log-in information. That is, the first user's user ID and password for the user account for the Google Docs application may be encrypted with the token and may be stored in the space of "user**1**" in the database that corresponds to the Google Docs application. Also, the second user's user ID and password for the user account for the Google Calendar application may be encrypted with the token and may be stored in the space of "user**2**" in the database that corresponds to the Google Calendar application.

The storage of the user log-in information is performed by the user log-in information managing unit **121** in the control unit **120**, and the log-in maintenance managing unit **122** manages a log-in to a user account for an application by using user log-in information that is stored in a database that corresponds to the application.

In more detail, the log-in maintenance managing unit **122** periodically transmits a token, which is included in the user log-in information, to a cloud server so that the log-in maintenance managing unit **122** maintains the log-in to the user account for the application. In the aforementioned two examples, the log-in maintenance managing unit **122** periodically transmits the token, which is stored to match "user**1**" in the database that corresponds to the Google Docs application, to the cloud server that provides the Google Docs service, so that the log-in maintenance managing unit **122** allows the first user to maintain the log-in status to the user account for the Google Docs application.

Also, the log-in maintenance managing unit **122** periodically transmits the token, which is stored to match "user**2**" in the database that corresponds to the Google Calendar application, to the cloud server that provides the Google Calendar service, so that the log-in maintenance managing unit **122** allows the second user to maintain the log-in status to the user account for the Google Calendar application.

The log-in maintenance managing unit **122** maintains the log-in status to the user account for the application by periodically transmitting the token to the cloud server, unless the user intentionally logs out from the user account for the application. Also, although the user may log out from the user account for the image forming apparatus **100**, the log-in maintenance managing unit **122** periodically transmits the token to the cloud server, thereby allowing the user to maintain the log-in status to the user account for the application.

Thus, once the user logs into the user account for the application, although the user logs out from the user account for the image forming apparatus **100** and then logs in again to the user account for the image forming apparatus **100**, the user may maintain the log-in status to the user account for the application. Also, unless the user intentionally logs out from the user account for the application, the user may maintain the log-in status to the user account for the application, regardless of an elapsed time from a point of time when the user last used the application.

In conclusion, once the user logs into the user account for the application, the user may directly use the application without performing a log-in again to that application, so that user convenience is improved.

When the user inputs an application execution command while the user does not log into the user account for the application, the control unit **120** may automatically perform the log-in to the user account for the application. To do so, it is required for the user log-in information to include the user ID and the password for the user account for the application.

In more detail, for example, when the user that logs into the user account for the image forming apparatus **100** logs into a user account for the Google Docs application, the user log-in information managing unit **121** stores a user ID and a password for the user account for the Google Docs application, and also stores a token from the cloud server in the user log-in information that matches the user account for the image forming apparatus **100** in the database that corresponds to the Google Docs application. Afterward, if the user intentionally logs out from the user account for the Google Docs application, the token that is stored in the user log-in information is deleted. That is, only the user ID and the password for the user account for the Google Docs application remain in the user log-in information. Thus, after the user logs out from the user account for the Google Docs application, if the user executes the Google Docs application, the control unit **120** may transmit the user ID and the password that are stored in the user log-in information to the cloud server, and thus may automatically perform the log-in to the Google Docs application.

As described above, when the user who logged in and then logged out from the user account for the application executes the application, the log-in to the user account for the application is automatically performed by using the user log-in information, so that the user may skip a vexatious log-in process.

FIGS. **2** through **5** illustrate operations that are performed in the image forming apparatus **100** and a cloud server **200** when a method of managing a log-in to a cloud-based application is performed, according to embodiments of the present inventive concept. Hereinafter, the method of managing a log-in to a cloud-based application is described in detail with reference to FIGS. **2** through **5**.

Referring to FIG. **2**, in operation S**201**, a user logs into a user account for the image forming apparatus **100**, and then, in operation S**202**, the user logs into a user account for an application. When the log-in to the user account for the application is successful, in operation S**203**, the cloud server **200** transmits a token to the image forming apparatus **100**. When the image forming apparatus **100** receives the token from the

cloud server **200**, in operation S**204**, the image forming apparatus **100** stores the token in user log-in information that is stored in a database corresponding to the application. Here, the token is stored in the user log-in information that matches the user account for the image forming apparatus **100**.

After the token is stored in the user log-in information, in operation S**205**, the image forming apparatus **100** periodically transmits the token in the user log-in information to the cloud server **200**, thereby allowing the user to maintain the log-in to the user account for the application. Although the user logs out from the user account for the image forming apparatus **100**, the image forming apparatus **100** periodically transmits the token in the user log-in information to the cloud server **200**, thereby allowing the user to maintain the log-in status to the user account for the application. Also, regardless of an elapsed time from a point of time when the user last used the application, the image forming apparatus **100** periodically transmits the token to the cloud server **200**, thereby allowing the user to maintain the log-in status to the user account for the application.

However, if the user intentionally logs out from the user account for the application, the token is deleted from the user log-in information and the transmission of the token no longer occurs.

Referring to FIG. **3**, in operation S**301**, a user logs into a user account for the image forming apparatus **100**, and then, in operation S**302**, the user inputs an application execution command. In operation S**303**, the image forming apparatus **100** checks user log-in information in a database that corresponds to an application. That is, the image forming apparatus **100** checks the user log-in information, which corresponds to the user account for the image forming apparatus **100**, from the database that corresponds to the application for which the application execution command is input.

If a token is included in the checked user log-in information, it means that a user's log-in to a user account for the application is maintained, and thus, in operation S**304**, an application execution screen is displayed to the user. Then, in operation S**305**, the cloud server **200** provides an application service according to a user input, and although a use of the application has ended, in operation S**306**, the image forming apparatus **100** periodically transmits the token included in the user log-in information to the cloud server **200**, thereby maintaining the log-in status to the user account for the application.

Referring to FIG. **4**, in operation S**401**, a user logs into a user account for the image forming apparatus **100**, and then, in operation S**402**, the user inputs an application execution command. In operation S**403**, the image forming apparatus **100** checks user log-in information in a database that corresponds to an application. That is, the image forming apparatus **100** checks the user log-in information, which corresponds to the user account for the image forming apparatus **100**, from the database that corresponds to the application for which the application execution command is input.

If a token is not included in the checked user log-in information, it means that a user's log-in to a user account for the application has not been maintained, and thus, in operation S**404**, a screen for a log-in to the user account for the application is displayed to the user. In operation S**405**, the image forming apparatus **100** waits to receive a user ID and a password from the user, and in operation S**406** after the user ID and password have been received, the image forming apparatus **100** attempts an automatic log-in by transmitting the received user ID and the password to the cloud server **200**. When the log-in is successful (user ID and password are correct), in operation S**407**, the cloud server **200** transmits the token to the image forming apparatus **100**, and in operation S**408**, the image forming apparatus **100** stores the received token in the user log-in information. In operation S**409**, the image forming apparatus **100** periodically transmits the token that is stored in the user log-in information to the cloud server **200**, thereby maintaining the log-in status to the user account for the application.

Although the user logs out from the user account for the image forming apparatus **100**, the image forming apparatus **100** periodically transmits the token in the user log-in information to the cloud server **200**, thereby maintaining the log-in status to the user account for the application. Also, regardless of an elapsed time from a point of time when the user last used the application, the image forming apparatus **100** periodically transmits the token to the cloud server **200**, thereby maintaining the log-in status to the user account for the application.

Referring to FIG. **5**, in operation S**501**, a user logs into a user account for the image forming apparatus **100**, and then, in operation S**502**, the user inputs an application execution command. In operation S**503**, the image forming apparatus **100** checks user log-in information in a database that corresponds to an application. That is, the image forming apparatus **100** checks the user log-in information, which corresponds to the user account for the image forming apparatus **100**, from the database that corresponds to the application for which the application execution command is input.

If a token is not included in the checked user log-in information, it means that a user's log-in to a user account for the application has not been maintained, and thus, in operation S**504**, the image forming apparatus **100** attempts an automatic log-in to the user account for the application by using the user log-in information. Thus, in operation S**505**, the image forming apparatus **100** transmits a user ID and a password that are included in the user log-in information to the cloud server **200**, and when the log-in is successful, in operation S**506**, the cloud server **200** transmits the token to the image forming apparatus **100**.

In operation S**507**, the image forming apparatus **100** stores the received token in the user log-in information, and in operation S**508**, the image forming apparatus **100** periodically transmits the token that is included in the user log-in information to the cloud server **200**, thereby maintaining the log-in to the user account for the application.

FIGS. **6** through **9** are flowcharts of a method of managing a log-in to a cloud-based application, according to exemplary embodiments of the present inventive concept. Hereinafter, the method of managing a log-in to a cloud-based application according to exemplary embodiments is described in detail with reference to FIGS. **6** through **9**.

Referring to FIG. **6**, in operation S**601**, a user logs into a user account for a multi-function printer (MFP), and then, in operation S**602**, the user logs into a user account for an application. When the log-in to the user account for the application is successful, in operation S**603**, the MFP receives a token from a cloud server. In operation S**604**, the MFP stores the token in user log-in information in a database that corresponds to the application, and in operation S**605**, the MFP periodically transmits the token that is stored in the user log-in information to the cloud server, thereby maintaining the log-in status to the user account for the application.

Although the user logs out from the user account for the MFP, the MFP periodically transmits the token in the user log-in information to the cloud server, thereby maintaining the log-in status to the user account for the application. Also, regardless of an elapsed time from a point of time when the user last used the application, the MFP periodically transmits

the token to the cloud server, thereby maintaining the log-in status to the user account for the application.

As described above, unless the user intentionally logs out from the user account for the application, the log-in status to the user account for the application is maintained, so that once the user logs into the user account for the application, the user may directly use the application without being required to perform a log-in process again.

Referring to FIG. **7**, in operation **S701**, a user logs into a user account for a MFP. After the user logs into the user account for the MFP, in operation **S702**, the user inputs an execution command to execute an application that is installed in the MFP, via a user interface unit of the MFP. After the MFP receives the execution command to execute the application, in operation **S703**, the MFP checks user log-in information in a database that corresponds to the application. In operation **S704**, as a result of checking whether the user log-in information includes a token, if the token is included, the method proceeds to operation **S710**, in which the MFP displays an application execution screen on a display unit.

However, in operation **S704**, as a result of the checking, if the user log-in information does not include the token, the method proceeds to operation **S705**, in which the MFP displays a screen for a log-in to a user account for the application on the display unit. In operation **S706**, the user logs into the user account for the application by inputting a correct user ID and a password. When the log-in is successful (correct ID and password), in operation **S707**, the MFP receives a token from a cloud server, and then in operation **S708**, the MFP stores the received token in the user log-in information in the database that corresponds to the application. In operation **S709**, the MFP periodically transmits the token that is included in the user log-in information to the cloud server, thereby maintaining the log-in to the user account for the application.

Referring to FIG. **8**, in operation **S801**, a user logs into a user account for a MFP, and then, in operation **S802**, the user logs into a user account for an application. When the log-in to the user account for the application is successful, in operation **S803**, the MFP receives a token from a cloud server. In operation **S804**, the MFP stores a user ID and a password of the user of the user account for the application, and the received token in user log-in information in a database that corresponds to the application, and in operation **S805**, the MFP periodically transmits the token that is stored in the user log-in information to the cloud server, thereby maintaining the log-in to the user account for the application.

Although the user logs out from the user account for the MFP, the MFP periodically transmits the token in the user log-in information to the cloud server, thereby maintaining the log-in status to the user account for the application. Also, regardless of an elapsed time from a point of time when the user last used the application, the MFP periodically transmits the token to the cloud server, thereby maintaining the log-in status to the user account for the application.

As described above, unless the user intentionally logs out from the user account for the application, the log-in status to the user account for the application is maintained, so that once the user logs in to the user account for the application, the user may directly use the application without being required to perform a log-in process again.

Referring to FIG. **9**, in operation **S901**, a user logs into a user account for a MFP. After the user logs into the user account for the MFP, in operation **S902**, the user inputs an execution command to execute an application that is installed in the MFP, via a user interface unit of the MFP. After the MFP receives the execution command to execute the application, in operation **S903**, the MFP checks user log-in information in a database that corresponds to the application. In operation **S904**, as a result of checking whether the user log-in information includes a token, if the token is included, the method proceeds to operation **S910**, in which the MFP displays an application execution screen on a display unit.

However, in operation **S904**, as a result of the checking, if the user log-in information does not include the token, the method proceeds to operation **S905**, in which the MFP automatically attempts a log-in to a user account for the application by using the user log-in information. That is, the MFP transmits the user ID and the password that are included in the user log-in information to the cloud server. If the log-in is successful, in operation **S906**, the MFP receives a token from the cloud server. Then, in operation **S907**, the MFP stores the received token in the user log-in information, and in operation **S908**, the MFP periodically transmits the token that is included in the user log-in information to the cloud server, thereby maintaining the log-in to the user account for the application.

As described above, when the user who logged in and then logged out from the user account for the application executes the application, the log-in to the user account for the application is automatically performed by using the user log-in information, so that the user may skip a vexatious log-in process.

According to exemplary embodiments of the present inventive concept, the image forming apparatus stores the user log-in information in the database that corresponds to the application installed in the image forming apparatus, so as to match the user log-in information with a user account for the image forming apparatus, and then the image forming apparatus maintains the log-in to the user account for the application by using the stored user log-in information, so that the user may directly use the application in the image forming apparatus without a vexatious log-in process.

Although a few embodiments of the present general inventive concept have been shown and described, it will be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the general inventive concept, the scope of which is defined in the appended claims and their equivalents.

What is claimed is:

1. An image forming apparatus comprising:

a communication interface unit to perform communication with a cloud server that provides an application service;

a user interface unit to display a screen and receive a user input;

a storage unit to store a database that corresponds to an application that is installed in the image forming apparatus;

an image forming operation performing unit to perform an image forming operation;

a control unit, wherein the control unit stores user log-in information in the database that corresponds to the application, so as to match the user log-in information with a user account for the image forming apparatus, and manages a log-in to a user account for the application by using the stored user log-in information;

a user log-in information managing unit to receive a token from the cloud server, encrypt the token for security, and store the encrypted token in the user log-in information that matches with the user account for the image forming apparatus, when the user, who logs into the user account for the image forming apparatus, logs into the user account for the application, and

a log-in maintenance managing unit to maintain the log-in status to the user account for the application by periodi-

cally transmitting the token that is stored in the user log-in information to the cloud server.

2. The image forming apparatus of claim **1**, wherein, when the control unit receives an application execution command from the user who logs into the user account for the image forming apparatus, the control unit checks the user log-in information that matches the user account for the image forming apparatus from the database that corresponds to the application, and when the user log-in information includes a token, the control unit displays an application execution screen on the user interface unit.

3. The image forming apparatus of claim **1**, wherein, unless the user intentionally logs out from the user account for the application, the log-in maintenance managing unit maintains the log-in status to the user account for the application by periodically transmitting the token that is stored in the user log-in information to the cloud server.

4. The image forming apparatus of claim **1**, wherein, although the user logs out from the user account for the image forming apparatus, the log-in maintenance managing unit maintains the log-in status to the user account for the application by periodically transmitting the token that is stored in the user log-in information to the cloud server.

5. The image forming apparatus of claim **1**, wherein, when the user logs out from the user account for the application, the user log-in information managing unit deletes the user log-in information that corresponds to the user account for the image forming apparatus.

6. The image forming apparatus of claim **1**, wherein the user log-in information managing unit stores the token along with a user identification (ID) and a password for the user account for the application in the user log-in information.

7. The image forming apparatus of claim **6**, wherein, when the control unit receives an application execution command from the user who logs into the user account for the image forming apparatus, the control unit checks the user log-in information that matches the user account for the image forming apparatus from the database that corresponds to the application, and when the user log-in information does not include a token, the control unit transmits the user ID and the password that are stored in the user log-in information to the cloud server.

8. The image forming apparatus of claim **7**, wherein, when the database that corresponds to the application does not store user log-in information, the control unit provides a screen for a log-in to a user account for the application to the user.

9. The image forming apparatus of claim **8**, wherein, when the control unit receives the user ID and the password from the user, transmits the user ID and the password to the cloud server, and then succeeds in the log-in, the control unit receives a token from the cloud server and stores the user ID, the password, and the received token in the user log-in information.

10. The image forming apparatus of claim **1**, wherein a user ID and a password are encrypted along with the token.

11. A method of managing a log-in to a cloud-based application, the method comprising:

receiving an application execution command related to the cloud-based application from a user who logs into a user account for an image forming apparatus;

storing user log-in information in a database that corresponds to the cloud-based application, so as to match the user log-in information with the user account for the image forming apparatus;

managing the log-in to a user account for the cloud-based application by using the stored user log-in information;

when the user logs into the user account for the cloud-based application, receiving a token from a cloud server that provides a service of the cloud-based application, and encrypting the token for security;

wherein the storing of user log-in information comprises storing the encrypted token in the user log-in information, and

wherein the managing of the log-in comprises maintaining the log-in to the user account for the cloud-based application by periodically transmitting the token that is stored in the user log-in information to the cloud server.

12. The method of claim **11**, wherein the managing of the log-in comprises maintaining the log-in to the user account for the cloud-based application by periodically transmitting the token to the cloud server unless the user intentionally logs out from the user account for the cloud-based application.

13. The method of claim **11**, wherein the managing of the log-in comprises maintaining the log-in to the user account for the cloud-based application by periodically transmitting the token to the cloud server although the user logs out from the user account for the image forming apparatus.

14. A method of managing a log-in to a cloud-based application, the method comprising:

receiving an application execution command related to the cloud-based application from a user who logs into a user account for an image forming apparatus;

checking user log-in information that matches the user account for the image forming apparatus and that is stored in a database that corresponds to the cloud-based application;

managing the log-in to a user account for the cloud-based application by using the stored user log-in information;

upon receiving a token from a cloud server, encrypting the token;

wherein the storing of user log-in information comprises storing the encrypted token in the user log-in information, and

wherein the managing of the log-in comprises maintaining the log-in to the user account for the cloud-based application by periodically transmitting the token that is stored in the user log-in information to the cloud server.

15. The method of claim **14**, wherein, when the user log-in information stores the token that is received from a cloud server that provides a service of the cloud-based application after encrypting the token, the managing of the log-in comprises displaying an application execution screen to the user.

16. The method of claim **14**, wherein, when the user log-in information does not comprise a token that is received from a cloud server that provides a service of the cloud- based application, the managing of the log-in comprises displaying a screen for a log-in to a user account for the cloud-based application to the user.

17. The method of claim **14**, wherein the user log-in information stores a user identification (ID) and a password for the user account for the cloud-based application, and when the user log-in information does not comprise a token that is received from a cloud server that provides a service of the cloud-based application, the managing of the log-in comprises automatically performing a log-in to the user account for the cloud-based application by transmitting the user ID and the password that are stored in the user log-in information to the cloud server.

18. A non-transitory computer-readable recording medium having recorded thereon a program for executing, the method comprising:

receiving an application execution command related to the cloud-based application from a user who logs into a user account for an image forming apparatus;

storing user log-in information in a database that corresponds to the cloud-based application, so as to match the user log-in information with the user account for the image forming apparatus;

managing the log-in to a user account for the cloud-based application by using the stored user log-in information;

when the user logs into the user account for the cloud-based application, receiving a token from a cloud server that provides a service of the cloud-based application, and encrypting the token for security;

wherein the storing of user log-in information comprises storing the encrypted token in the user log-in information, and

wherein the managing of the log-in comprises maintaining the log-in to the user account for the cloud-based application by periodically transmitting the token that is stored in the user log-in information to the cloud server.

19. An image forming apparatus that communicates with a cloud

server which provides application services, the image forming apparatus comprising: a user interface unit to display a screen and receive a user input;

a storage unit to store databases that correspond to respective applications that are installed in the image forming apparatus;

a control unit to store user log-in information in the databases corresponding to the respective applications, so as to match the user log-in information with a user account for the image forming apparatus, and to manage a log-in to a user account for each application by using the stored user log-in information;

a user log-in information managing unit to receive a token from the cloud server, encrypt the token, and store the encrypted token in the user log-in information that matches with the user account for the image forming apparatus, when the user, who logs into the user account for the image forming apparatus, logs into a user account for one of the applications, and

a log-in maintenance managing unit to maintain the log-in status to the user account for the application by periodically transmitting the token that is stored in the user log-in information to the cloud server.

20. The image forming apparatus of claim **19**, wherein, when the control unit receives an application execution command from the user who logs into the user account for the image forming apparatus, the control unit checks the user log-in information that matches the user account for the image forming apparatus from the database that corresponds to the application, and when the user log-in information includes a token, the control unit displays an application execution screen on the user interface unit.

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